

LISTING OF CLAIMS

1. (Currently Amended) A method for adapting a digital subscriber line (DSL) communications duplexing scheme ratio to meet user application needs, comprising the steps of:

determining, for a new DSL loop communication, a required upstream bit rate and a required downstream bit rate for the user application;

dividing the required upstream bit rate by the required downstream bit rate to obtain a desired duplexing ratio for the new DSL communication; and

adapting a duplexing scheme ratio implemented by a DSL modem in support of the new DSL loop communication to at least approximate the desired duplexing ratio.

2. (Currently Amended) The method as in claim 1 wherein the step of adapting the duplexing scheme ratio comprises the step of adjusting analog filters to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

3. (Currently Amended) The method as in claim 1 wherein the step of adapting the duplexing scheme ratio comprises the step of adjusting digital filters to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

4. (Original) The method as in claim 1 wherein the step of determining further comprises the step of removing unnecessary idle ATM cells, and the required upstream/downstream bit rate for the new DSL loop communication is a bit rate needed for the new DSL loop communication without inclusion of unnecessary idle ATM cells.

5. (Currently Amended) The method as in claim 1 wherein the implemented duplexing ~~scheme ratio~~ defines certain numbers and locations of the subcarriers less than in a total available upstream bandwidth and a total available downstream bandwidth for the new DSL loop communication on a certain DSL loop

6. (Currently Amended) The method as in claim 1 ~~{5}~~ wherein the required upstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier upstream bandwidth for the adapted duplexing scheme that is smaller than a ~~the~~ total available upstream bandwidth, the method further comprising the steps of:

calculating, for a plurality of subcarrier location positions of the required multi-subcarrier upstream bandwidth for the new DSL loop communication within the corresponding total available upstream bandwidth, a crosstalk noise effect of the new DSL loop communication with respect to other active DSL loops in a same cable bundle; and

choosing a location position for the required multi-subcarrier upstream bandwidth to carry the new DSL loop communication within the total available upstream bandwidth where the calculated crosstalk noise effect with respect to any other active DSL loops is minimized.

7. (Currently Amended) The method as in claim 1 ~~{5}~~ wherein the required downstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier downstream bandwidth for the adapted duplexing scheme that is smaller than ~~a the~~ total available downstream bandwidth, the method further comprising the steps of:

calculating, for a plurality of subcarrier location positions of the required multi-subcarrier downstream bandwidth for the new DSL loop communication within the corresponding total available downstream bandwidth, a crosstalk noise effect of the new DSL loop communication with respect to other active DSL loops in a same cable bundle; and

choosing a location position for the required multi-subcarrier downstream bandwidth to carry the new DSL loop communication within the total available downstream bandwidth where the calculated crosstalk noise effect with respect to any other active DSL loops is minimized.

8. (Currently Amended) The method as in claim 1 ~~{5}~~ ~~further comprising calculating and choosing as recited in both claims 6 and 7~~ wherein the required upstream/downstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier upstream/downstream bandwidth for the adapted duplexing scheme that is smaller than a total available upstream/downstream bandwidth, the method further comprising the steps of:

calculating, for a plurality of subcarrier location positions of the required multi-subcarrier upstream/downstream bandwidth for the new DSL loop communication within the corresponding total available upstream/downstream bandwidth, a crosstalk noise effect of the new DSL loop communication with respect to other active DSL loops in a same cable bundle; and

choosing a location position for the required multi-subcarrier upstream/downstream bandwidth to carry the new DSL loop communication within the total available upstream/downstream bandwidth where the calculated crosstalk noise effect with respect to any other active DSL loops is minimized, so as to minimize both upstream and downstream crosstalk noise.

9. (Currently Amended) The method as in claim 8 wherein the step steps of calculating further includes ~~include~~ the step of sliding the required multi-subcarrier upstream/downstream bandwidth of the adapted duplexing scheme across the total available upstream/downstream bandwidth at the plurality of subcarrier location positions for which crosstalk noise effect is calculated.

10. (Original) The method as in claim 8 wherein the crosstalk noise effect is near-end crosstalk (NEXT) noise effect.

11. (Original) The method as in claim 8 wherein the calculated crosstalk noise effect is an estimation calculated effect.

12. (Original) The method as in claim 8 wherein the calculated crosstalk noise effect is an analytically calculated effect.

13. (Currently Amended) The method as in claim 1 wherein the DSL modem is selectively configurable to implement any one of a plurality of discrete duplexing schemes ~~ratios~~, the step of adapting further comprising the step of selecting a certain one of the discrete duplexing schemes ~~ratios~~ that most closely meets the desired duplexing ratio.

14. (Currently Amended) The method as in claim 1 further including the steps of:
monitoring noise on subcarriers used to implement the duplexing scheme ~~ratio~~ for the new DSL loop communication;
testing if the monitored noise exceeds a threshold on any of the subcarriers; and
if so, abandoning the subcarrier.

15. (Currently Amended) The method as in claim 1 further including the step of canceling echoes when upstream and downstream are overlapped in the adapted duplexing scheme ~~ratio~~.

16. (Currently Amended) Apparatus for adapting a digital subscriber line (DSL) communications duplexing scheme ratio to meet user application needs, comprising:

means for determining, for a new DSL loop communication, a required upstream bit rate and a required downstream bit rate for the user application, the required upstream bit rate being divided by the required downstream bit rate to obtain a desired duplexing ratio for the new DSL communication; and

means for adapting a duplexing scheme ratio implemented by a DSL modem in support of the new DSL loop communication to at least approximate the desired duplexing ratio.

17. (Currently Amended) The apparatus as in claim 16 wherein the means for adapting the duplexing scheme ratio operates to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

18. (Currently Amended) The apparatus as in claim 16 wherein the means for adapting the duplexing scheme ratio is operable to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

19. (Original) The apparatus as in claim 16 wherein the means for determining operates to remove unnecessary idle ATM cells, and the required upstream/downstream bit rate for the new DSL loop communication is a bit rate needed for the new DSL loop communication without inclusion of unnecessary idle ATM cells.

20. (Currently Amended). The apparatus as in claim 16 wherein the implemented duplexing ~~scheme ratio~~ defines certain numbers and locations of the subcarriers less than in a total available upstream bandwidth and a total available downstream bandwidth for the new DSL loop communication on a certain DSL loop.

21. (Currently Amended) The apparatus as in claim 16 ~~20~~ wherein the required upstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier upstream bandwidth for the adapted duplexing scheme that is smaller than a the total available upstream bandwidth, the apparatus further comprising:

means for calculating, for a plurality of subcarrier location positions of the required multi-subcarrier upstream bandwidth for the new DSL loop communication within the corresponding total available upstream bandwidth, a crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

means for choosing a location position for the required multi-subcarrier upstream bandwidth to carry the new DSL loop communication within the total available upstream bandwidth where the calculated crosstalk noise effect of the new DSL loop communication with respect to any other active DSL loops is minimized.

22. (Currently Amended) The apparatus as in claim 16 ~~20~~ wherein the required downstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier downstream bandwidth for the adapted duplexing scheme that is smaller than a ~~the~~ total available downstream bandwidth, the apparatus further comprising:

means for calculating, for a plurality of subcarrier location positions of the required multi-subcarrier downstream bandwidth for the new DSL loop communication within the corresponding total available downstream bandwidth, a crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

means for choosing a location position for the required multi-subcarrier downstream bandwidth to carry the new DSL loop communication within the total available downstream bandwidth where the calculated crosstalk noise effect of the new DSL loop communication with respect to any other active DSL loops is minimized.

23. (Currently Amended) The apparatus as in claim ~~16~~ 20 ~~further comprising means for calculating and means for choosing as recited in both claims 21 and 22 operable wherein the~~ required upstream/downstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier upstream/downstream bandwidth for the adapted duplexing scheme that is smaller than a total available upstream/downstream bandwidth, the apparatus further comprising:

means for calculating, for a plurality of subcarrier location positions of the required multi-subcarrier upstream/downstream bandwidth for the new DSL loop communication within the corresponding total available upstream/downstream bandwidth, a crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

means for choosing a location position for the required multi-subcarrier upstream/downstream bandwidth to carry the new DSL loop communication within the total available upstream/downstream bandwidth where the calculated crosstalk noise effect of the new DSL loop communication with respect to any other active DSL loops is minimized, so as to minimize both upstream and downstream crosstalk noise.

24. (Currently Amended) The apparatus as in claim 23 wherein the means for calculating operates to slide the required multi-subcarrier upstream/downstream bandwidth across the total available upstream/downstream bandwidth of the adapted duplexing scheme at the plurality of location positions for which crosstalk noise effect is calculated.

25. (Original) The apparatus as in claim 23 wherein the crosstalk noise effect is near-end crosstalk (NEXT) noise effect.

26. (Original) The apparatus as in claim 22 wherein the calculated crosstalk noise effect is an estimation calculated effect.

27. (Original) The apparatus as in claim 23 wherein the calculated crosstalk noise effect is an analytically calculated effect.

28. (Currently Amended) The apparatus as in claim 16 wherein the DSL modem is selectively configurable to implement any one of a plurality of discrete duplexing schemes ratios, the means for adapting further operates to select a certain one of the discrete duplexing schemes ratios that most closely meets the desired duplexing ratio.

29. (Currently Amended) The apparatus as in claim 16 further including:
means for monitoring noise on subcarriers used to implement the duplexing scheme ratio for the new DSL loop communication;
means for testing if the monitored noise exceeds a threshold on any of the subcarriers;
and
means responsive thereto for abandoning the subcarrier.

30. (Currently Amended) The apparatus as in claim 16 further including an echo canceler operable to cancel echoes when upstream and downstream are overlapped in the adapted duplexing scheme ratio.

31. (Currently Amended) A digital subscriber line (DSL) transceiver connected to a certain loop in a cable bundle, comprising:

an idle cell removal machine that is operable to determine for a new DSL loop communication on the certain loop a required upstream bit rate and a required downstream bit rate for a user application, the required upstream bit rate being divided by the required downstream bit rate to obtain a desired duplexing ratio for the new DSL communication;

a duplexing controller operable to adapt a duplexing scheme ~~ratio~~ implemented in support of the new DSL loop communication to at least approximate the desired duplexing ratio.

32. (Currently Amended) The transceiver as in claim 31 wherein the duplexing controller implements any one of a plurality of discrete duplexing schemes ~~ratios~~, the duplexing controller being further operable to select a certain one of the discrete duplexing schemes ~~ratios~~ that most closely meets the desired duplexing ratio.

33. (Original) The transceiver as in claim 31 further including analog filters that are adjustable to alter an upstream and downstream bandwidth used for the new DSL loop communication.

34. (Original) The transceiver as in claim 31 further including digital filters that are adjustable to alter an upstream and downstream bandwidth used by the modem for the new DSL loop communication.

35. (Original) The transceiver as in claim 31 wherein the idle cell removal machine further operates to remove unnecessary idle ATM cells, and the required upstream/downstream bit rate for the new DSL loop communication is a bit rate needed for data communication over the certain loop without inclusion of unnecessary idle ATM cells.

36. (Currently Amended) The transceiver as in claim 31 wherein the implemented duplexing ~~scheme ratio~~ defines certain numbers and locations of the subcarriers less than in a total available upstream bandwidth and a total available downstream bandwidth for the new DSL loop communication on a certain DSL loop.

37. (Currently Amended) The transceiver as in claim ~~31~~ 36 wherein the required upstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier upstream bandwidth for the adapted duplexing scheme that is smaller than ~~a the~~ total available upstream bandwidth, the transceiver further comprising:

a bandwidth control algorithm for calculating, for a plurality of subcarrier location positions of the required multi-subcarrier upstream bandwidth for the new DSL loop communication within the corresponding total available upstream bandwidth, a crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

a noise minimization algorithm for choosing a location position for the required multi-subcarrier upstream bandwidth to carry the new DSL loop communication within the total available upstream bandwidth where the calculated crosstalk noise effect of the new DSL loop communication with respect to any other active DSL loops is minimized.

38. (Currently Amended) The transceiver as in claim 31 ~~36~~ wherein the required downstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier downstream bandwidth for the adapted duplexing scheme that is smaller than a ~~the~~ total available downstream bandwidth, the transceiver further comprising:

a bandwidth control algorithm for calculating, for a plurality of subcarrier location positions of the required multi-subcarrier downstream bandwidth for the new DSL loop communication within the corresponding total available downstream bandwidth, a crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

a noise minimization algorithm for choosing a location position for the required multi-subcarrier downstream bandwidth to carry the new DSL loop communication within the total available downstream bandwidth where the calculated crosstalk noise effect of the new DSL loop communication with respect to any other active DSL loops is minimized.

39. (Currently Amended) The transceiver as in claim ~~31~~ ~~36~~ ~~further operable wherein~~ the required upstream/downstream bit rate of the new DSL loop communication corresponds to a required multi-subcarrier upstream/downstream bandwidth for the adapted duplexing scheme that is smaller than a total available upstream/downstream bandwidth, the transceiver further comprising:

a bandwidth control algorithm for calculating, for a plurality of subcarrier location positions of the required multi-subcarrier upstream/downstream bandwidth for the new DSL loop communication within the corresponding total available upstream/downstream bandwidth, a crosstalk noise effect with respect to other active DSL loops in a same cable bundle; and

a noise minimization algorithm for choosing a location position for the required multi-subcarrier upstream/downstream bandwidth to carry the new DSL loop communication within the total available upstream/downstream bandwidth where the calculated crosstalk noise effect of the new DSL loop communication with respect to any other active DSL loops is minimized so as to minimize both upstream and downstream crosstalk noise.

40. (Currently Amended) The transceiver as in claim 39 wherein the noise minimization algorithm operates to slide the required upstream/downstream bandwidth of the adapted duplexing scheme across the total available multi-subcarrier upstream/downstream bandwidth at the plurality of location positions for which crosstalk noise effect is calculated.

41. (Original) The transceiver as in claim 39 wherein the crosstalk noise effect is near-end crosstalk (NEXT) noise effect.

42. (Original) The transceiver as in claim 39 wherein the calculated crosstalk noise effect is an estimation calculated effect.

43. (Original) The transceiver as in claim 39 wherein the calculated crosstalk noise effect is an analytically calculated effect.

44. (Currently Amended) The transceiver as in claim 31 further including a bandwidth manager operable to monitor noise on subcarriers used to implement the duplexing scheme ratio for the new DSL loop communication, test if the monitored noise exceeds a threshold on any of the subcarriers, and abandon the subcarrier if the noise exceeds the threshold.

45. (Currently Amended) The transceiver as in claim 31 further including an echo canceler operable to cancel echoes when upstream and downstream are overlapped in the adapted duplexing scheme ratio.

46. (Original) The transceiver as in claim 45 wherein the echo canceler is designed to operate at a maximum overlapping bandwidth between the upstream and the downstream.